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TSCA Confidential Business Information Center (7407M)
EPA East - Room 6428 Attn: Section 8(e)
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460-0001



Re: TSCA 8(e) notice regarding isocyanate generation from urethane-containing surface conditioning discs

To whom it may concern:

3M Company is submitting the following information pursuant to Section 8(e) of the Toxic Substances Control Act (TSCA). While 3M does not believe the study results described below indicate a significant risk of injury to health or the environment, 3M is submitting this information in light of the U.S. Environmental Protection Agency's interest in isocyanates generally and pursuant to the agency's guidance indicating its interpretation of Section 8(e) of TSCA.

The subject data were generated in a study initiated by 3M and conducted in collaboration with the Lund Institute of Occupational and Environmental Medicine in Sweden (3M/Lund study). The 3M/Lund study, as summarized below, is based in part on a prior study conducted independently by the Lund Institute, which indicated the potential to generate isocyanates by thermal degradation of urethane during use of two 3M surface conditioning disc products under certain extreme operating conditions (Lund study). The 3M/Lund study repeated operating conditions defined in the Lund study (products, tools and operating conditions) under controlled laboratory conditions with additional QA/QC measures and sample collection locations at a range of distances from the operating disc. As summarized below, the results show the potential to generate isocyanates under certain use conditions, and that isocyanates may be detected at various distances for certain high speed operations.

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Background

The potential of urethane and other isocyanate-based materials to generate isocyanates during thermal decomposition is well documented in the public literature. The study results being submitted here provide information on particular products and the particular levels observed under certain use conditions.

3M/Lund Study

Area air samples were collected for a simulated worker study using 3M H1-ZS and 3M CG-ZS surface conditioning discs on welded stainless steel plates with a 900 watt, GE 900 plus industrial hand held polishing machine in a non-ventilated room with dimensions of 6 x 4.2 x 2.5 meters. Polishing machine speed settings were measured prior to all trials using a Shimpo DT-105 tachometer. Samples were collected using impingers with toluene and dibutyl amine (DBA) derivatizing agent and 13 mm glass fiber filters for analysis by ISO 17734 method with liquid chromatography / mass spectroscopy (LC/MS) for the following isocyanates:

- Isocyanic acid (HNCO)
- Methyl isocyanate (MIC)
- Phenyl isocyanate (PI)
- Hexamethylene diisocyanate (HDI)
- Toluene 2,4-diisocyanate (2,4-TDI)
- Toluene 2,6-diisocyanate (2,6-TDI)
- Isophorone diisocyanate (IPDI)
- Methylene diisocyanate (MDI)

For each trial, area samples were collected for 5 minutes at 3 static locations positioned an average of 29 cm (Location 1), 83 cm (Location 2) and 234 cm (Location 3) from the stainless steel polishing plate.

Results:

- For all trials, all samples for MIC, PI, HDI and IPDI were all below detection limits (0.1 and 0.2 ppb) and many below detection limits for HNCO, 2,4 TDI, 2,6 TDI and MDI.
- The first trial was performed on the 3M CG-ZS disc with an estimated speed of 6,100 rpm (revolutions per minute).
 - Location 1 detectable 2,4 TDI of 1.1 ppb
 - Location 2 detectable 2,4 TDI of 0.3 ppb
 - Location 3 detectable 2,4 TDI of 0.2 ppb

- The second trial was performed on the 3M H1-ZS disc with an estimated speed of 2,700 rpm
 - Location 1 detectable HNCO of 0.9 ppb
 - Location 2 all isocyanates below detection limits
 - Location 3 all isocyanates below detection limits
- The third trial was performed on the 3M H1-ZS disc with an estimated speed of 4,700 rpm
 - Location 1 detectable 2,4 TDI, 2,6 TDI and MDI of 0.8, 0.2 and 0.1 ppb, respectively
 - Location 2 HNCO at the detection limit of 0.5 ppb
 - Location 3 all isocyanates below detection limits.
- The fourth trial was performed on the 3M H1-ZS disc with an estimated speed of 6,100 rpm
 - Location 1 detectable HNCO, 2,4 TDI, 2,6 TDI and MDI; results pending.
 - Location 2 detectable HNCO, 2,4 TDI, 2,6 TDI and MDI of 1.6, 2.1, 0.5 and 0.1 ppb respectively
 - Location 3 detectable HNCO, 2,4 TDI and 2,6 TDI of 1.0, 1.4 and 0.3 ppb respectively
- The fifth trial was performed on the 3M H1-ZS disc with an estimated speed of 6,100 rpm with excessive force applied to polishing surface.
 - Location 1 detectable HNCO, 2,4 TDI, and MDI; results pending.
 - Location 2 detectable HNCO and 2,4 TDI of 0.5 and 0.3 ppb respectively
 - Location 3 detectable 2,4 TDI of 0.2 ppb

Lund Study

Area air samples were collected for a simulated worker study using 3M H1-ZS and 3M CG-ZS polishing discs on stainless steel with a 900 watt, GE 900 plus industrial hand held polishing machine in a non-ventilated 6 x 4 x 3 meter maintenance shed. Samples were collected for approximately 4 minutes each using impingers with toluene and dibutyl amine (DBA) derivatizing agent, 13 mm glass fiber filters and analyzed using a modified ISO 17734 method using liquid chromatography / mass spectroscopy (LC/MS) for 2,4-toluene diisocyanate (2,4 TDI), 2,6-toluene diisocyanate (2,6 TDI) and methylene diisocyanate (MDI).

The first trial was performed with CG-ZS disc with an estimated speed of 6,000 rpm (revolutions per minute). Three subsequent trials were performed with H1-ZS disc at estimated speeds of 2,500, 4,400 and 6,000 rpm. Each area sample was collected at approximately 15cm from the surface of the disc for approximately 4 minutes.

A background sample collected during all of the trials 3 meters from the polishing machine location with results for 2,4 TDI, 2,6 TDI and MDI were 2.5, 0.6 and 0.2 ppb (parts per billion) respectively. Results for the CG-ZS disc at 6,000 rpm for 2,4 TDI, 2,6 TDI and MDI were 0.4, 0.03 and 0.05 ppb respectively. Results for the H1-ZS disc at 2,500 rpm for 2,4 TDI, 2,6 TDI and MDI were 0.2, <0.2 and <0.2 ppb respectively. Results for the H1-ZS disc at 4,400 rpm for 2,4 TDI, 2,6 TDI and MDI were 0.8, 0.2 and 0.1 ppb respectively. Results for the H1-ZS disc at 6,000 rpm for 2,4 TDI, 2,6 TDI and MDI were 4.5, 1.3 and 1.1 ppb respectively.

Study Limitations

The study results provide information regarding the potential to generate detectable levels of isocyanates under certain use conditions of two urethane-containing industrial surface conditioning discs. The subject samples were static samples (not attached to a worker) collected in a controlled laboratory setting. The results do not represent actual exposure data and their utility in evaluating potential exposure during actual use conditions is limited for a number of reasons, including:

- *Surface speed dependence.* Available data indicate that the potential to generate isocyanates from product use decreases with decreasing surface speed, *i.e.*, the speed at which the surface of the disc is moving across the surface being polished. The data collected in the studies are based solely on use of new discs with the largest available disc diameter, which generates the maximum effective surface speed. Isocyanate generation during actual product use (assuming constant rpm and other use conditions), if any, would be expected to decrease substantially as the disc is worn down, because the effective surface speed drops as the diameter of the disc is reduced.
- *Sample collection.* As summarized above, the 3M/Lund study included samples collected at three distances from the surface conditioning disc for 5 minutes each. These samples collected at static locations do not represent actual exposure levels and are of varying relevance for gauging potential exposure levels during actual product use. Samples collected nearest to the disc, such as Location 1 in the 3M/Lund study and all samples in the Lund study, are taken from locations that are not in the operator's breathing zone; rather, the locations were chosen to maximize isocyanate collection. Therefore, these sample results are of particularly limited relevance for evaluating potential exposure levels during actual product use.
- *Analytical method.* The analytical method used for these studies has the potential to systematically overstate potential isocyanate exposure levels due to the capture and extraction of isocyanates bound in, or to, particles, including

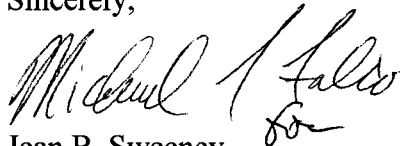
polyurethane or other product components. The significance of this effect is unknown and may vary as a function of use conditions and sampling location.

- *Use conditions.* The highest levels of isocyanates detected in the studies summarized below are observed at the maximum operating speed (6100 rpm) of the polishing machine. This speed is almost double the highest recommended operating speed for the 3M discs.¹ The tool used in these studies is a high-rpm electric motor-driven industrial tool, which creates substantially higher torque than commonly used pneumatic tools. Also, actual disc usage time periods will vary depending on the specific application and other factors, which may depart substantially from the specific test conditions maintained during the 5-minute sampling intervals reported above.

While 3M does not believe that any of these data taken alone or cumulatively meet the "substantial risk" reporting threshold as defined by the EPA, we nevertheless recognize the EPA may have interest in these data. Therefore, we are placing these results in the 8(e) docket.

If you have any questions or would like any additional information, please contact Deanna Luebker at (651) 737-1374 or djluebker@mmm.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael J. Sweeney" with a stylized flourish at the end.

Jean B. Sweeney
Staff Vice President, 3M Environmental, Health and Safety Operations

¹ The maximum operating speed (MOS) is defined according to industry standard tests and relates to product integrity and preventing structural failure. The MOS for the two products tested here is 6100 rpm. 3M's recommended operating speeds for these discs in cleaning and conditioning applications, such as tested in these studies, is 1275 to 3200 rpm for a 6-inch diameter disc.



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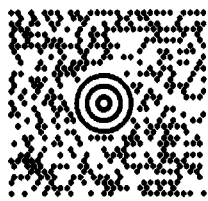
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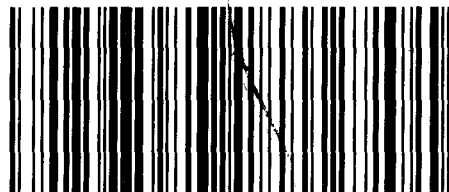
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